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(54) Apparatus for manufacturing panels.

(57) An installation for manufacturing panels used in building construction which panels comprise a metal framework of two parallel meshes joined by connector wires which obliquely pass through a core of lighweight material between the two parallel meshes to which latter said connector wires are welded, the installation including a conveyor device for entry into the machine, a first section of an intermittent traction and advancing device within the machine, a dispensing device for feeding connector wires to a fastening device for inserting them in the lightweight core, a second section of the intermittent traction and advancing device, a column of electrodes for welding the connector wires, a third section of the intermittent traction and advancing device, a saw device for shaping the resulting panels and automated mechanisms and systems for controlling all these elements.

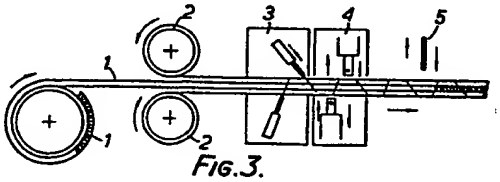

FIG.3.

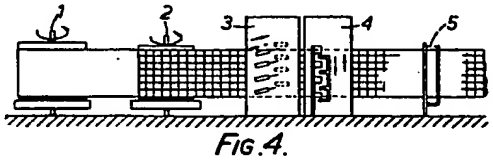

FIG.4.

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Apparatus for manufacturing panels

This invention provides an apparatus or installation for the manufacture of a compound panel comprising a metal framework with a lightweight core, suitable for use in building construction.

The metal framework of the panel is a three-dimensional wire grill or grating, normally in the form of two parallel meshes joined together by a series of wires welded to them, hereinafter referred to as connectors.

The lightweight core may be a layer of foam resin or dense box material, fibre or plastics, with reinforcing walls which will allow a segment of wire easily to pass through it.

These panels can be building elements used in the construction as walls or flooring and then coated with resistant mortar on both sides; the panels can easily be joined to one another on the building site by conventional means. Known panels of this type were made with very fine wire (2mm gauge, and mesh opening of 50mm) and were manufactured according to the following process:

1) The vertical meshes of the panel were preconstructed in ladderlike form, that is, with two parallel wires between which short cross-members were welded.

2) These elements were inserted in welding machines in a vertical position, and crosswires were welded to them to form the complete spatial structure.

3) These structures were slightly sunk or embedded in a sand bed which was made to advance upon a conveyor belt, and a foam resin was sprayed on them to form the light-weight core.

The panels were constructed in standard sizes (5m x 1.20m, for example), making it necessary later to cut them on the job, with the consequential losses and expense.

Production took place in large sheds or buildings (of an area of more than $500m^2$) which demanded costly investment and full-time personnel.

According to the invention there is provided apparatus for the manufacture of panels suitable for use in building construction, in which the panels comprise a metal frame work in the form of a three dimensional grill or grating enclosing a lightweight core, the grill or grating being in the form of two parallel, spaced meshes joined by a plurality of elongate connector members, the connector members being inclined with respect to the planes of the wires of the two meshes, the apparatus being characterised in that it comprises:

a) a conveyor device which introduces two spaced parallel sheets of mesh with an intermediate sheet of a lightweight material into

b) a machine having

c) a first section including an intermittent traction and advancing device for intermittently moving the two sheets of mesh and the intermediate sheet a predetermined distance towards

d) a fastening device,

e) a dispensing device which provides a series of elongate connector members to be driven by the fastening device into the sheet of lightweight material in such a manner that their ends contact wires of the two meshes,

f) a second section of the intermittent traction and advancing device arranged intermittently to move the two sheets of mesh, the intermediate sheet and the connector members to

g) welding means arranged to weld the connector members to the wires of the two meshes.

The problems mentioned above are resolved, or alleviated, in an embodiment of this invention by means of an installation consisting of: a machine into one end of which are introduced, parallel and separated a suitable distance, two rolls of mesh and a sheet of lightweight material (foamed polystyrene, for example), the interior of the machine containing a system for intermittent traction which successively moves the two meshes and the sheet of lightweight material a fixed distance, equal to the size of the rectangular opening of the mesh, until they reach a fastening device consisting of a vertical battery of dischargers, which device drives a series of connector-wire segments into the sheet of lightweight material, the ends of the segments resting against the longitudinal wires of the two meshes; in continuation, there is a second section of the intermittent advancing system which moves the unit thus constituted, with the connector wires in place, to a position in front of a welding means, such as a column of electrodes which weld the connector-wire segments to the longitudinal wires of the two meshes; finally, a third section of the intermittent advancing system moves the panels with the inserted connector wires to a saw arrangement comprising, for example, one or more disk, band or laser beam saws which cut the panels to the desired size; lastly the installation contains the essential and appropriate automated mechanisms and systems.

In the first section of the installation, the manipulation of thousands of units of wire segments presents difficulties in the feeding of the machine, since any trouble

or flaw could cause jamming. To avoid this, resort can be made to an alternative process somewhat similar to that used in stapling machines.

First, a series of connector wires are joined back-to-back in the form of combs, and their teeth or prongs are gummed with a lacquer to hold them together on a plane. The machine is fed with packs of combs in a process much more orderly than handling loose wires. In addition, one load of wires can be sufficient for a full day's work by the machine so that there is no longer any need to continuously load the hoppers.

The subsequent detachment of the wires from each comb, one by one for their insertion, is performed by a guillotine similar to that used in staplers, which places the wire in front of a gun fastener which thereupon drives it into the lightweight core.

The connectors may also be joined to form a continuous and flexible comb roll, using an elastic bonding lacquer with an adhesive support backing. In such a case the connectors are fed from comb rolls suspended above the machine.

The combs are made outside the machine in a continuous process employing a lacquer applicator, an infrared dryer and a cutter.

In the second section of the installation, the welders grouped in columns advance and retract as the mesh passes, and it is fundamental that their electrodes always locate with a certain exactness, by pressure upon it, the cross formed by the end of the connector and the longitudinal wire of the mesh.

To achieve this, in a development of the invention, a mechanism has been selected by means of which the mesh, during its advance inside the machine, is drawn over a smooth belt or idler rollers, propelled by a retractable hook which intermittently pulls against a vertical wire of the mesh. The system of fastening the meshes and the polystyrene sheet to a continuous conveyor belt or endless chain moved by constant impulses has been discarded.

The advantage of the device adopted is that even though there are panels of imperfect size (within a normal tolerance) which differ slightly from the fixed advance rate of the machine (adapted to a standard opening), there is no accumulation of defects or a maladjustment in the positioning of the said crosses facing the electrodes.

Naturally, there is a hook on each side for each mesh, and two on each side make traction smoother and serve to overcome any possible snag of the mesh roll.

A special embodiment of the installation is movable, and can be transported by truck to a job site. Another improvement is the provision of means for adhering, to one side of the lightweight core and prior to placement of the corresponding wire mesh, an aluminium or plastics sheet to serve as a vapour barrier.

In the present invention the panels are made with larger mesh sections (approximately 10 x 10cms) and with heavier wire (from 2.5mm and up) than the known panels disclosed hereinbefore, thereby simplifying the process considerably, greatly reducing cost and introducing the innovation of manufacture of the panel in an endless sheet which can be cut to an exact size as it exits from the machine. Only one continuous machine is required for the entire process, and the installation can be carried easily by truck to the construction site (as it occupies a space smaller than $25m^2$).

A basic factor in the feasibility of this new system of manufacture has been the renunciation of a great density of fine mesh, which was thought necessary to prevent the sprayed mortar from falling off; however, experience has shown that there is fully satisfactory adherence with a 10 x 10cms opening having one connector in each panel, with care in the spraying of the mortar which should be applied in two layers, one several hours after the other, and with scraping or scratching of the surface of the lightweight core to give it a rough surface.

Another basic factor has been the extensive selection of any suitable lightweight foam or paperboard which can be used, provided it can hold the driven wires; in the prior art system, it was first necessary to make the wire structure, then spray its interior with the foam resin core.

It would be difficult to use the system described in this invention with the fine wire meshes previously used, since the great number of connectors and the reduced space for inserting the electrodes between the wires would greatly hinder the process.

Increased wire gauge is a notable improvement offered by the system, since there is greater resistance to rust (especially in storage at the building site), greater resistance to impacts during handling and greater rigidity of the panel during the process of assembly and concreting.

Owing to their function, connectors must be protected against rust, for which reason their composition can be important inasmuch as in certain cases the process of manufacture of the panels requires preliminary preparation. If the connectors are of stainless steel, the

process is the normal one previously explained, since stainless steel is weldable. But, if they are of galvanized iron, their ends must be denuded or pickled so that they can be welded. This is done by introducing the packs of connector combs by their teeth or prongs in an acid bath for several minutes at a depth of some 10mm, following which they are washed in a neutral solution.

If the surface of the connectors is plasticised or impregnated with already hardened resin, roll wire is used which is straightened and then cut into measured segments, some 10mm of the ends being ground or sharpened in an automatic machine, thereby becoming weldable where they intersect the mesh wires.

According to the process described, it is thus possible to manufacture panels of varying cross-section or of many shapes, bending the two principal meshes as desired and adapting the length of the connectors to them, giving the lightweight core a form conforming to the exterior surface of the meshes.

Before describing the installation, the following should be noted which determines one aspect of the process. The panels are to be rectangular, the longer side coinciding with the perpendicular walls. The diameter of the connectors approximates that of the mesh wires, and said connectors are welded to the longitudinal wires of the panels. They are inclined with respect to said longitudinal wires of the panels, for the purpose of absorbing the shear stresses produced between the two hard layers of the concreted panel. In summary, the longitudinal wires of the panel (those parallel to the major axis) are welded obliquely to the connectors, and thus it is best that the panel be made lying on its side (on a vertical plane, with its major axis horizontal).

Another improved embodiment of the invention includes adjacent auxiliary machines for producing the mesh from plain wire and, in substitution of a roll of sheeting of lightweight material which could be used, provision is made for a likewise adjacent extruder of said lightweight material which automatically extrudes the sheeting from raw resin foam.

The process of continuous feed of the lightweight core has been initially conceived on the basis of foam material (such as polystyrene), continuously manufactured in an extension preceding the panel-making machine. But it is possible that such material may not be profitable or usable for other reasons, making it necessary to consider continuous manufacture of the core from a paperboard base in an extension preceding the said machine.

In one such extension, manufacture commences from three rolls of paperboard.

The upper and lower outer surfaces of a continuous box-like or walled rectangular tube paperboard material proceed from respective parallel rolls of paperboard.

The heart or core between the two outer layers is a longitudinally-crimped prismatic roll of crenellated or dentated cross-section. Said crimped roll is obtained by means of a slitting mechanism and successive wheels which crease the paperboard to the eventual crenellated form, exerting pressure downward and laterally, which crimped roll is then glued or stapled to the upper and lower rolls to form said rigid boxlike material.

The upper or lower outer layer of the boxlike material can have a slightly curved cross-section, of special interest for manufacturing core as flooring.

The paperboard must undergo previous or posterior treatment based on anti-moisture resins, so that it is not affected by the mortar or concrete which will come in contact with it or by atmospheric humidity when the material is stacked on the job site, prior to use.

To facilitate the fastening of the connector wires, their points are beveled or chamfered for easier passage through the paperboard. This is done by cutting packs of wires obliquely with the disk of a saw.

Another improvement introduced is a panel-feeding arrangement followed by a manual stapling or spot-welding device, for joining the panels together to form the meshes. Also, an arrangement is provided for feeding panels of the said material, followed by a manual glueing or stapling device for joining the panels.

Finally, the installation can be adapted to manufacture elements of varying core thickness, and to fasten connector-wire segments of different length.

To be able to introduce different thicknesses of lightweight core and thus vary the thickness of the panel, the structure of the installation must be slightly modified.

The machine has a plane of symmetry coinciding with that of the panel during its manufacture. To make panels of different thickness the machine is divided along said plane, to either separate or bring together the two resulting halves. One of the halves remains fixed, while the other moves perpendicularly on wheels until blocked at the required distance.

In the selection of the geometry of the panel, certain dimensions must be invariable so as not to excessively

complicate the machine, within the required degrees of regulation. These fixed parameters can be:

The dimensions of the mesh panel.

The diameter of the mesh and of the connector

The distance between the mesh surface and the surface of the confronting core.

The distances from the weld-point of the connectors to the two adjacent junction points, which must be constant.

Instead of these fixed parameters, others can be fixed without varying the essence of the machine.

Of great importance for regulating the width of the machine is a guide device which maintains the lightweight core and meshes at the proper distance during the manufacturing process. This is a double series of welded vertical and horizontal guide pins, which act as separators between mesh and core and which cover a zone from the column of welders to the entrance of the mesh, a distance of a minimum of three metres.

Upon "starting" the machine, it is important to maintain the relative position of the connector-fastening batteries and of the column of welders invariable with respect to the cited network of separator guide pins, which is on the same side.

The connector magazines contain partitions which permit the housing of connectors of different lengths. The discharge needles are of maximum length and serve for all cases. As the points of incidence of the connectors in relation to the longitudinal wires of the meshes must always be, (repeat, must always be), the same distance from the neighbouring junction points (so that the welders are always in front of an intersection of wires), it is necessary to vary the angle of insertion (of the

connectors with respect to the discharge needles), which will be of lesser inclination the greater the thickness of the panel.

To widen the machine, first the movable half is unblocked and is moved parallel to itself to the desired width; it is blocked once more, and immediately the angle of incidence of the connector fasteners is varied so that the connectors cross with the longitudinal wires of the meshes at the cited fixed points, and thus the electrodes of the welder tongs then perform their function without longitudinal movement, that is, they move only in perpendicular direction toward the surface of the meshes.

Embodiments of the invention will now be described by way of example, reference being made to the accompanying drawings, in which:-

Fig. 1 is a diagram in perspective of a panel made in an embodiment of an installation according to the invention, with the elements comprising it,

Fig. 2 represents a cross-section of the panel from the longitudinal or transverse direction,

Fig. 3 is a side view of the installation,

Fig. 4 shows the same installation in plan view,

Fig. 5 roughly shows a fastening device,

Fig. 6 is a diagram of an arrangement for feeding connectors to the fastening device,

Fig. 7 illustrates a comb of connectors, with the central portion daubed with lacquer,

Fig. 8 is a side view and Fig. 9 a plan view of another connector feeder-driver which can be substituted for the hoppers with extractor rollers as shown in Fig. 6. In the box-frame 3-5 of Figs. 8 and 9, the superimposed combs 2-1 are placed. The comb at the bottom is pushed by two rods 3-6, propelled in turn by springs 3-7. With a vertical movement, a guillotine 3-8 separates one by one the end wires housed in some slots and places them in front of the discharge needles 3-1. When the pusher 3-6 has propelled the last wire in the bottom comb it is pneumatically returned to its original starting position, permitting the next comb to drop into place by gravity, and the fastening cycle begins again,

Fig. 10 shows the discharge needle 3-1, which drives the wire which has already been separated from the comb 2-1 by the action of the guillotine 3-8. This is a continuous flexible comb variation on the embodiment of flat rigid combs as illustrated in Figs. 8 and 9. The roll is suspended above so as not to occupy space in the centre of the machine,

Fig. 11 illustrates a device for making the combs of wires. The hopper 5-1 drops the wires upon a conveyor belt; the viscous lacquer in hopper 5-3 drips upon the dispenser ring 5-2 and is solidified to film upon being heated by the infrared lamp 5-4; the continuous matting of wires is cut into combs with the disk 5-5,

Fig. 12 is a partial lateral view of the installation, and the sectional end view of Fig. 13 shows the retractable hooks which push the vertical wires of the meshes in their advance,

Figs. 14 and 15 illustrate pickling in a tray, of the ends of the connector wires 2-1, either in the rigid flat comb

or flexible roll arrangement, the units being placed with the wires in upright position in an acid bath 10mm deep,

Fig. 16 shows one of the welding columns of the installation, in the position in which the column of electrodes has been advanced to the welding position, while Fig. 17 is a view of the welding column in the phase of execution of the welding operation,

Figs. 18 and 19 show the invariable parameters

c = mesh panel

d = distance between mesh and core

b = distance to the adjacent junction from the point of intersection of connector and longitudinal wire of the mesh.

Variable on the other hand, are the width of the core e_1 or e_2, and the angle of incidence of the connector with respect to the mesh 2, which is greater as the thickness of the core increases,

Fig. 20 is a view in perspective of a continuous box-like paperboard as it enters the machine, ready to be pierced by the connector wires,

Fig. 21 is a cross-section of a paperboard box with the upper portion arched (a convenient form for recessing flooring, in the manner of a vault). The box is seen pierced by the connector wires,

Figs. 22, 23 and 24 illustrate how the slitting rollers mark a groove or trench in the crimped paperboard (formed by smooth paper glued to wrinkled or corrugated paper), and show the successive fold lines, and

In Figs. 25 and 26, the paperboard is shaped and propelled by some groups of wheels, which come together transversely as the paperboard advances and the rough relief gradually increases.

The machine functions in the following manner:

The lightweight core 1 is inserted in the installation from roll 1, represented in Figs. 3 and 4. Synchronous with the movement of the core, the upper and lower wire grilles 2, comprising the transverse wires 2-2 and the longitudinal wires 2-3, unroll from respective rolls 2 until they reach the fastener device 3, from which the connectors 2-1 are discharged and pass through the core 1, made for example of foam, by means of dischargers 3-1 similar to injection syringes, the needle of which propels the pertinent connector 2-1 located in the lowermost position of the series of connectors contained in the loader or magazine 3-2. Upon being propelled or discharged, the connector is lodged inside the core against the transverse wires 2-2, ready to be welded at its ends in the following phase.

The loader 3-2, represented particularly in Figs. 5 and 6, is fed from the hopper 3-4, the bottom of which contains two rollers 3-3 which turn in opposite directions and propel the connector wires one by one into the fastening device.

From the fastening device 3, the unit of meshes 2 and lightweight core 1 with connectors 2-1 embedded in the latter advances intermittently, propelled by the traction system of the installation, so that the connectors 2-1 are finally placed in front of the vertical battery of electrodes (Figs. 3 and 4).

In Figs. 16 and 17 only the welding column on one side of the machine has been represented, since the other column is identical. The upper electrodes 4-1 of the column are solid with a common vertical flange, and the lower electrodes 4-2 are solid with another parallel flange or are free and are operated pneumatically.

In the open position, the column is made to advance pneumatically to the position shown in Fig. 17, where the electrodes approach and resistance weld, aided by compression, the pairs of wires, for example 2-1 and 2-2. If the installed power does not permit this (for example, if the work is being done on the job site), the welding equipment could be modified by making cascade stippling, that is, simultaneously pressuring the wires in column but welding one after another.

Following the welding operation, all that remains is the cutting of the panels to size. A saw 5 (see Figs. 3 and 4) makes the cuts in the transverse direction if a band saw, or vertically if a disk saw or laser beam cutter (in the last case the cut is cleaner).

The preceding description must be considered purely illustrative and in no way limitative, and any and all variations, substitutions of material, etc., may be included which fall within the scope of the following claims.

Claims:

1. Apparatus for the manufacture of panels suitable for use in building construction, in which the panels comprise a metal framework in the form of a three dimensional grill or grating enclosing a lightweight core, the grill or grating being in the form of two parallel, spaced meshes joined by a plurality of elongate connector members, the connector members being inclined with respect to the planes of the wires of the two meshes, the apparatus being characterised in that it comprises:

a) a conveyor device which introduces two spaced parallel sheets of mesh with an intermediate sheet of a lightweight material into

b) a machine having

c) a first section including an intermittent traction and advancing device for intermittently moving the two sheets of mesh and the intermediate sheet a predetermined distance towards

d) a fastening device,

e) a dispensing device which provides a series of elongate connector members to be driven by the fastening device into the sheet of lightweight material in such a manner that their ends contact wires of the two meshes,

f) a second section of the intermittent traction and advancing device arranged intermittently to move the two sheets of mesh, the intermediate sheet and the connector members to

g) welding means arranged to weld the connector members to the wires of the two meshes.

2. An installation for the manufacture by a continuous process of compound panels for building construction, said panels being of variable cross-section and of any desired shape and comprising a metallic framework and a light-weight core, the metallic framework consisting of a three-dimensional wire grille or grating generally presented in

the form of two parallel meshes joined by a series of connector wires welded to them, said connector wires being inclined with respect to the wires of the meshes, the lightweight core comprising for example a layer of foam resin or dense box material, paperboard laminate, fibre or plastic material, provided with reinforcing walls and unresistant to a wire segment passing through it, characterised in that it comprises:

a) a conveyor device which introduces, parallel and separated a suitable distance, two sheets of mesh and one sheet of lightweight material which may be supplied from a roll into one end of

b) a machine of adjustable width the interior of which contains

c) a first section of an intermittent traction and advancing device which intermittently moves the two sheets of mesh and the sheet of lightweight material a regulated distance, until they reach

d) a fastening device consisting of a vertical battery of discharges to which

e) a dispensing device feeds a series of connector-wire segments which are then driven by the fastening device into the sheet of lightweight material, the ends of said wire segments resting against the longitudinal wires of the two meshes which advance intermittently inside the machine;

f) a second section of the intermittent traction and advancing device which moves the unit thus constituted, with the connector wires in place, to a position in front of

g) a welding means, such as a column of electrodes for welding the connector-wire segments to the longitudinal wires of the two meshes;

h) a third section of the intermittent traction and advancing device which moves the panels, along with the embedded connector elements, to

i) a saw device containing, for example, one or more disk, band or laser beam saws which cut the panels to the desired size, and

j) automated mechanisms and systems which control the operation of the aforementioned elements.

3. An installation according to claim 1 or 2 in which the mesh is fed to the conveyor device from a roll.

4. An installation according to claim 1, 2 or 3 characterised in that it is of movable type and can be transported by truck to the construction site.

5. An installation according to claim 1, 2, 3 or 4 characterised in that it contains some means for adhering, to one of the sides of the lightweight core prior to placement in relation to the corresponding wire mesh, an aluminium or plastics sheet to serve as a vapour barrier.

6. An installation according to any one of the preceding claims characterised in that for the supply of the two panel meshes, provision is made for respective adjacent auxiliary machines which produce the mesh starting from common wire and/or provision is made for an adjacent machine for the extrusion of the lightweight material, said machine automatically extruding the sheeting from raw resin foam.

7. An installation according to any one of claims 1 to 5 characterised in that for the supply of wire mesh, provision is made for a panel-feeding arrangement followed by a manual stapling or spot-welding device which joins the panels together to form the meshes.

8. An installation according to any one of claims 1 to 5 characterised in that provision is made for an arrangement

for feeding panels of the lightweight material, followed by a manual glueing or stapling device for joining the panels.

9. An installation according to any one of the preceding claims characterised in that it is adapted to manufacture elements having cores of varying thickness and to insert connector-wire segments of varying length.

10. An installation according to any one of claims 1 to 9 characterised in that the elements forming the panel are advanced by intermittent pushing of the vertical wires of the meshes, by means of one or more hooks moved by a piston located beneath the panel, the constant and regulated advance distance being equal to the length of a mesh opening, and in that after each advance is completed said hooks are separated laterally by some mechanical means to keep said hooks from fouling the vertical wires of the mesh upon returning to their original position, and in that during this operation the lightweight core is held fast to the meshes by means such as a cotter pin fastened to the lightweight core and simultaneously clamped around a wire of each mesh.

11. An installation according to any one of claims 1 to 10 characterised in that the connectors are handled in bulk, as flat or flexible combs in roll form, held together with a fixing means such as lacquer or adhesive tape, said combs entering the machine by means of a drive element which propels the comb units to a guillotine which separates each wire one by one, said separated wires then being driven into the lightweight core by said fastening device.

12. An installation according to any one of claims 1 to 11 characterised in that if the connector wires are of

normal steel and therefore should undergo surface treatment, prior to insertion in the machine they are subjected to denuding, for example, by pickling or grinding some 10mm along from each point, to thus permit said wires to be welded to the meshes.

13. An installation according to any one of claims 1 to 12 characterised in that for the regulation of the width of the machine it is divided into two halves on a symmetrical plane, one half being movable transversely, the columns of the wire-fastening devices being rotary-mounted so that regardless of the thickness of a panel, the points at which the connectors cross with the mesh wires are always in the same position with respect to the adjacent junction points, and in such manner that the welding electrodes always face an intersection of a connector with a longitudinal wire of the mesh.

14. An installation according to any one of claims 1 to 11 in which panels are manufactured with a paperboard core characterised in that the headpiece of the machine contains a system for deploying and glueing the paperboard elements constituting said core, which core is formed from three rolls of paperboard two of which form the flat upper and lower core surfaces which are glued to the ridges of a third continuous sheet of paperboard wrinkled or folded in dentate or crenellated form, such folding of said central layer of the core being realised by means such as crimping wheels, the wrinkling then proceeding progressively, for example, by several series of wheels or rollers which give increasingly more relief or height to the folds of the paperboard as it advances, said wheels simultaneously performing the function of advancing the paperboard.

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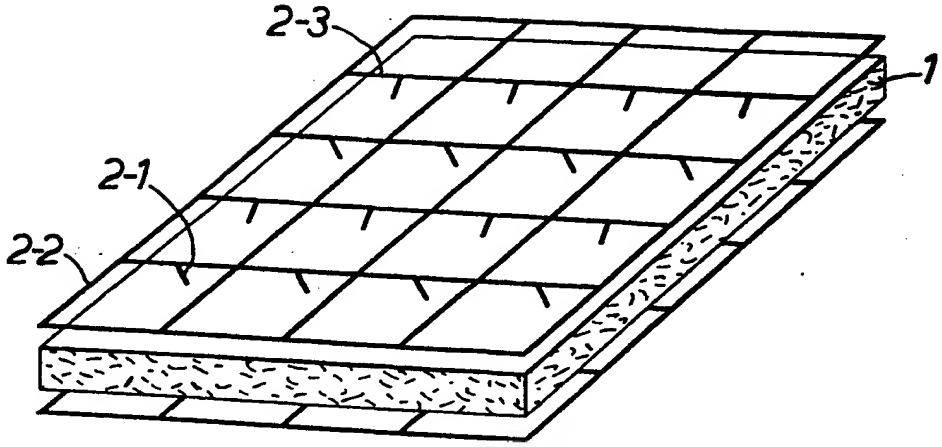

FIG.1.

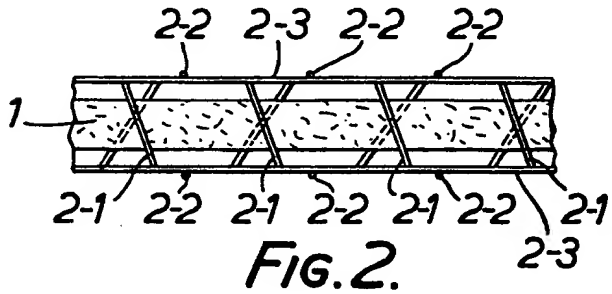

FIG.2.

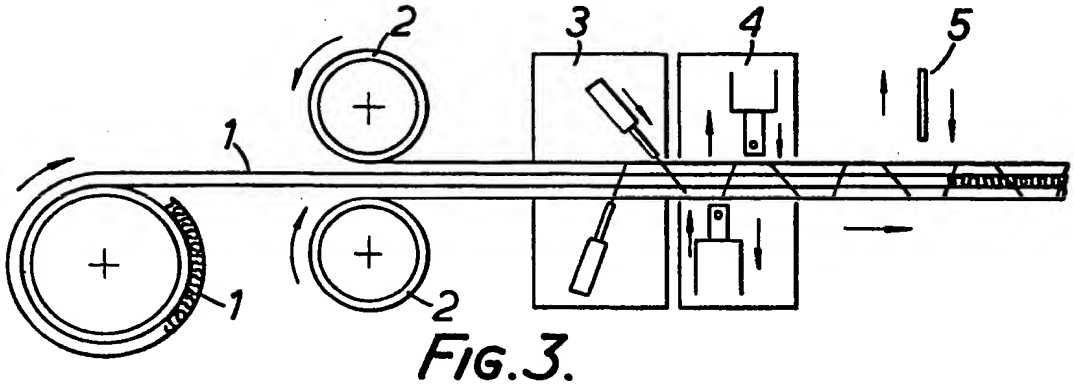

FIG.3.

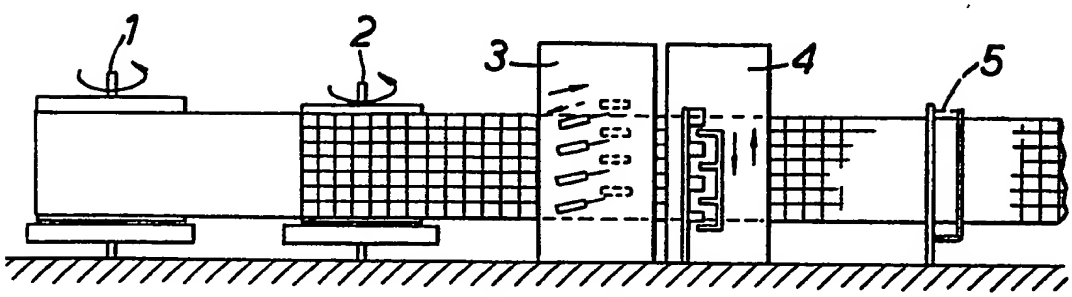

FIG.4.

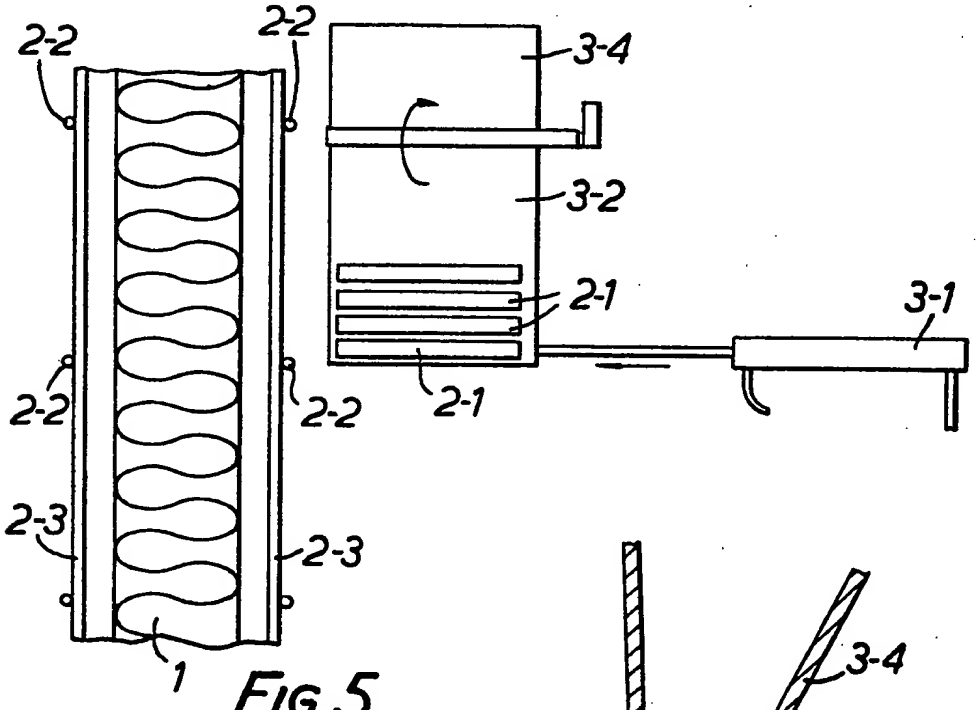

FIG.5.

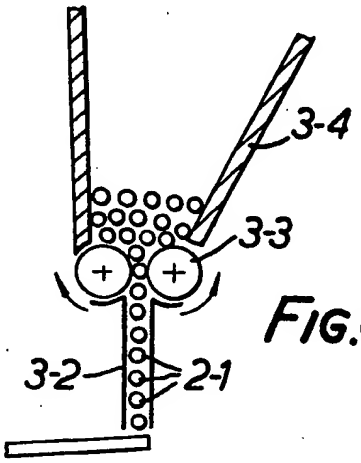

FIG.6.

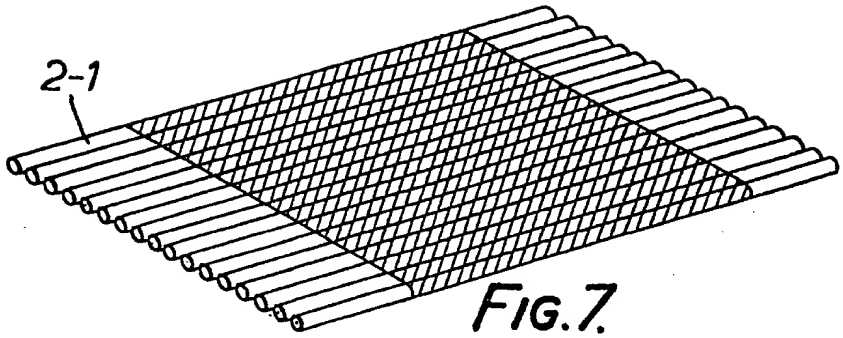

FIG.7.

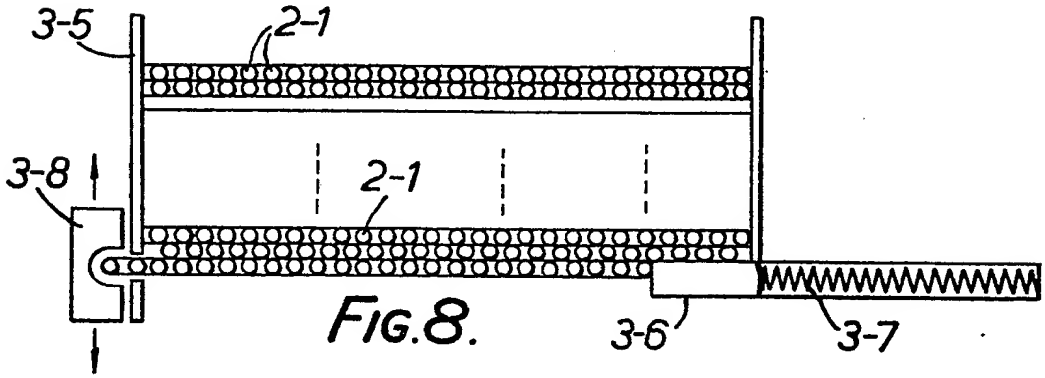

FIG.8.

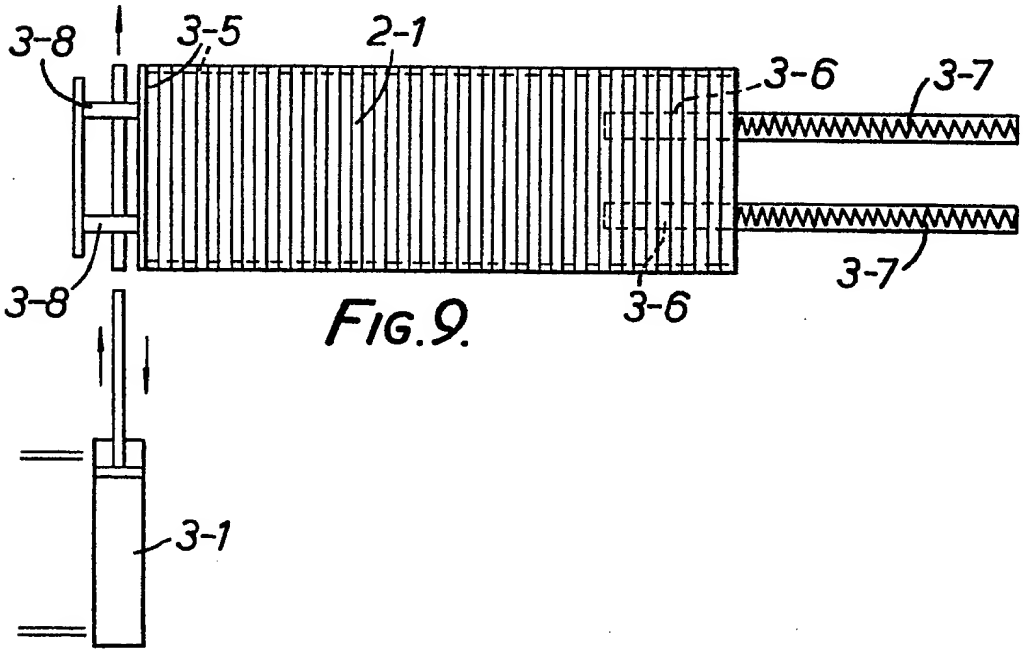

FIG.9.

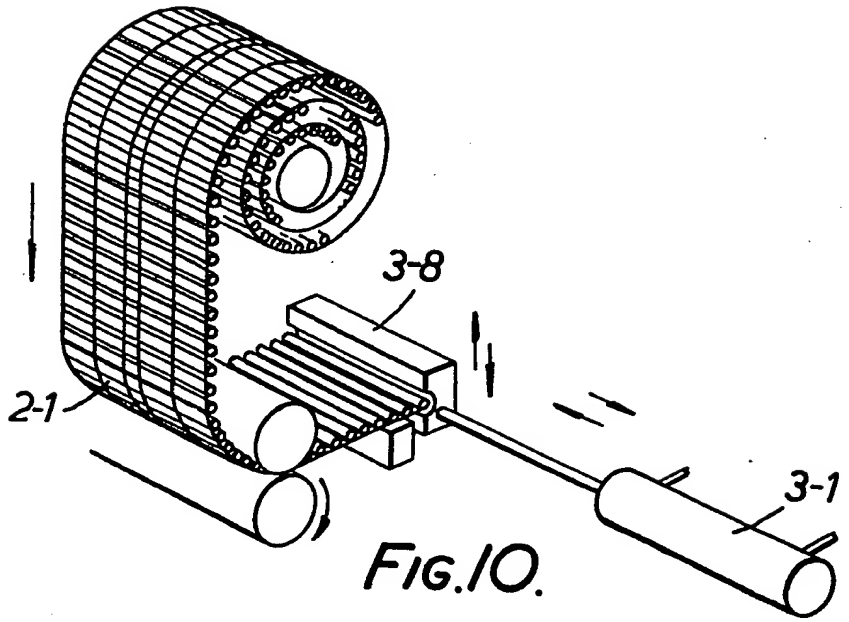

FIG.10.

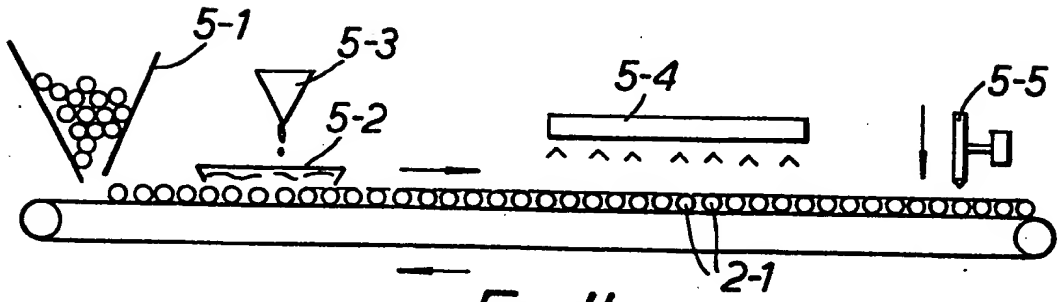

FIG.11.

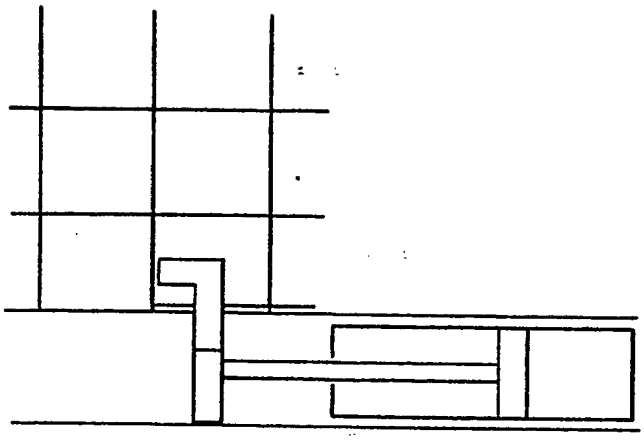

FIG.12.

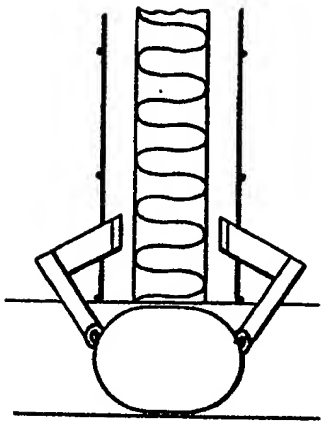

FIG.13.

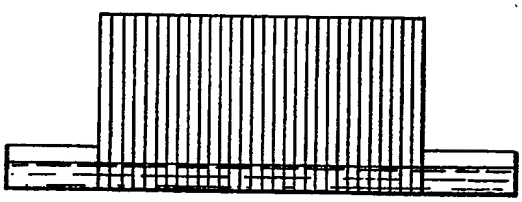

FIG.14.

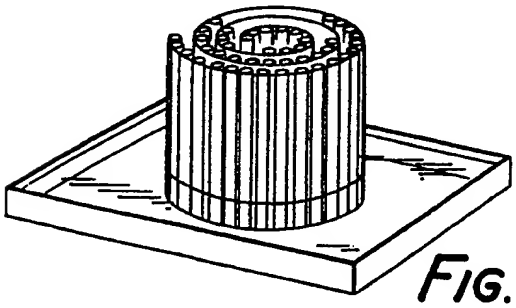

FIG.15.

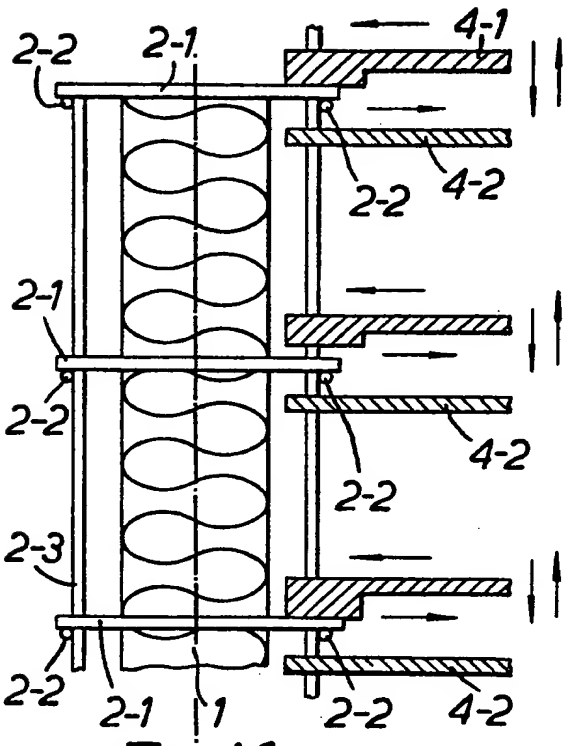

FIG. 16.

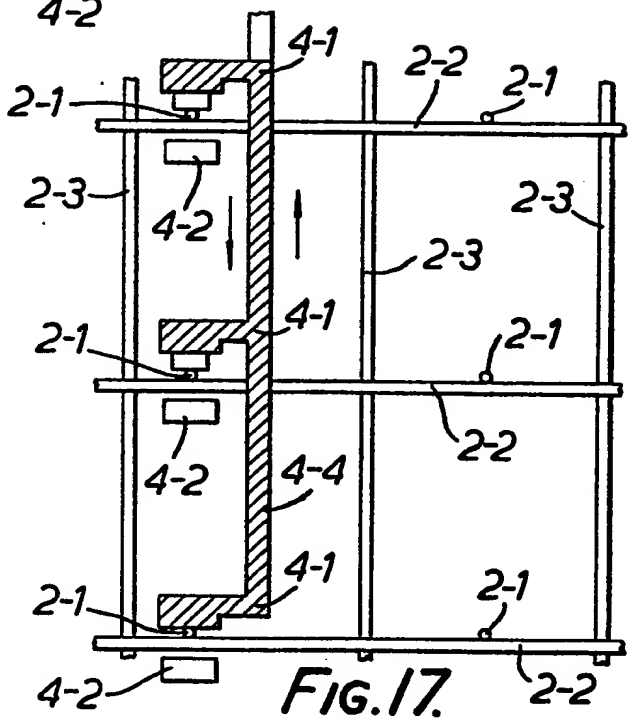

FIG. 17.

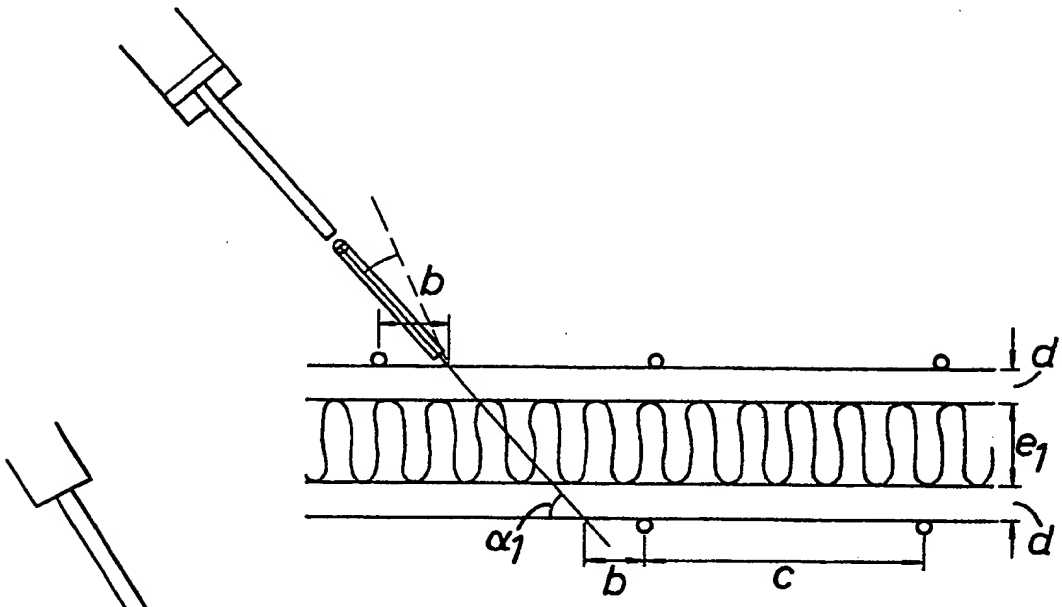

FIG. 18.

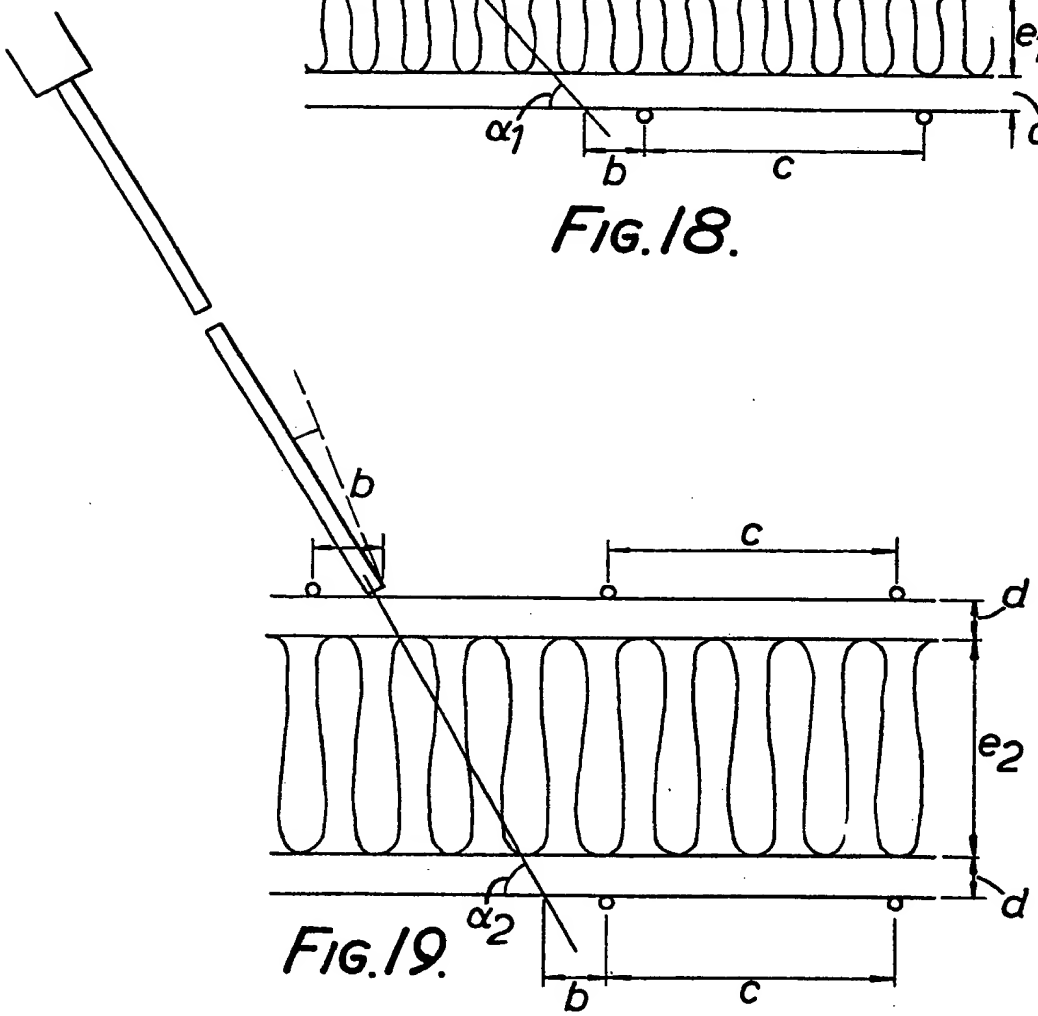

FIG. 19.

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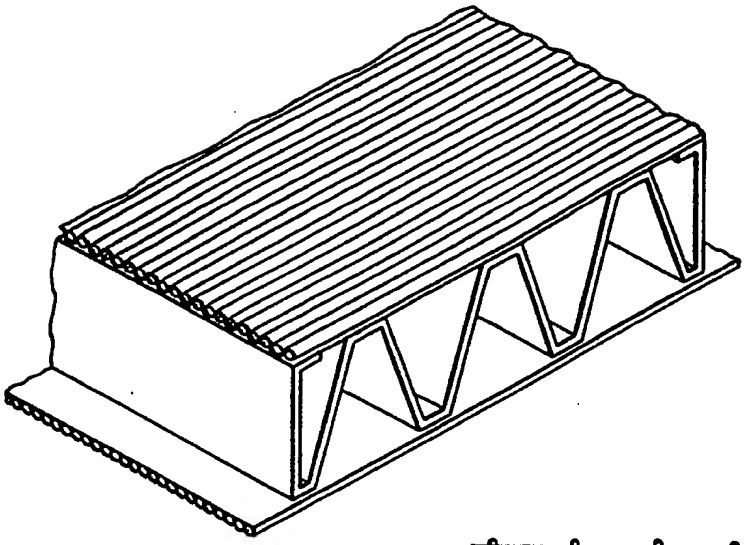

FIG. 20.

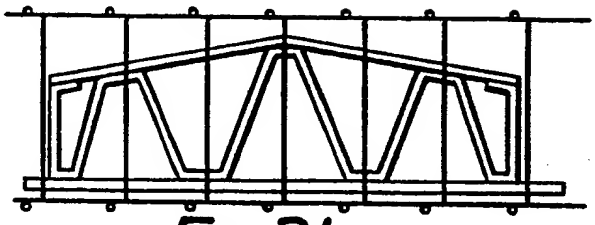

FIG. 21.

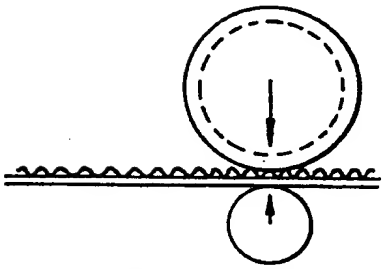

FIG. 22.

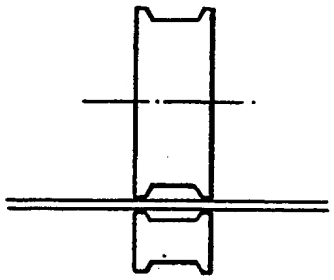

FIG. 23.

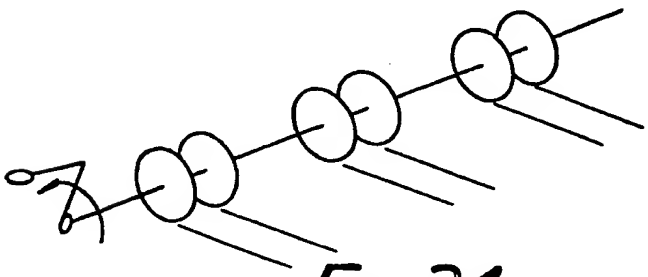

FIG. 24.

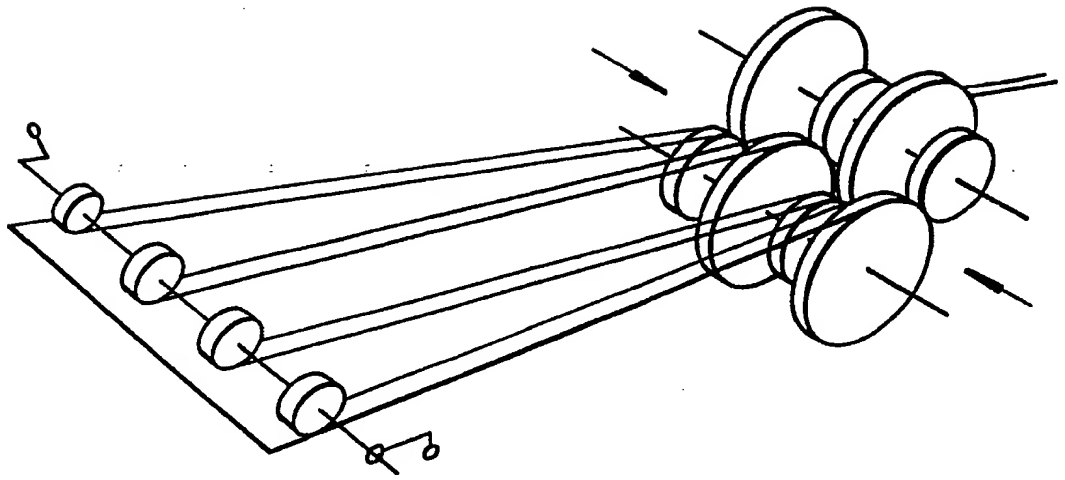

FIG.25.

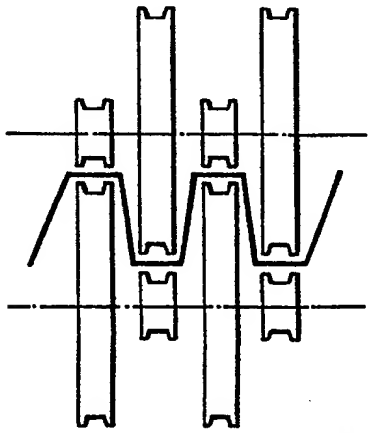

FIG.26.